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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/039,438	03/16/1998	WOO-SUP SHIN	041992-5037	9576

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EXAMINER	
ZERVIGON, RUDY	
ART UNIT	PAPER NUMBER
1716	
MAIL DATE	DELIVERY MODE
02/01/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/039,438	SHIN ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1716	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 October 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8 and 9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on December 15, 2010 has been entered.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schutt (US 3,532,568 A) in view of Chung et al (U. S. Pat. No. 5,000,795), Kanda (U.S.Pat. 4,338,157), and Allies, Victoria R. et al (U.S.Pat. 5,560,838) and further in view of Jones et al (U.S. Pat. No. 3,869,313). Schutt discloses an etching process and apparatus for chemically etching ("etching zone 1"; Sole figure) material from a substrate (copper, abstract). An etched product (iron; column 2, lines 1-10) is etched in unit 1 (Applicant's "etch bath") thereby at least contacting the solid with the aqueous liquid (sulfuric acid, HCl; column 1, lines 65-68) and the resulting liquid (3) is passed through an ion exchanger (8) to remove the ions from the rinse liquid which is reused or discharged. The solids are removed from an etcher ("etch bath") via a stream (3) which passes into a rinse chamber (5) including outlet pipe (7). The rinse liquid

stream (7) then goes through an ion exchanger means (8, second tank). A replenishing solution (9) from the ion exchange means is combined with the bulk storage tank (11, first tank) going to the etcher (1). The bulk storage tank (11, first tank) has a stream flowing to the etcher (1) for etching the product. Schutt further teaches a first tank (11) connected to the etch bath (1) to supply the first etchant to the etch bath (1), the concentration of the first etchant being controlled (via 5,8 - column 2; lines 45-72) in the first tank (11). That the etchant solution is "separated" and "diluted" is a manifestation of the ion exchange process and the closed-loop of Figure 1 continuously decreasing reactants and continuously increasing products, respectively.

Schutt does not disclose an immersion of a substrate in an etched bath or a bubble plate used therein.

Chung et al disclose a bubble plate (17) located on the floor of a tank (10; Fig. 1). The bubble plate (17) transmits inert gas to create a bubbling condition within the tank (10) for sufficient agitation (col. 1, lines 60-68). Silicon substrates (14; column 3, lines 44-48) are immersed in an etch bath ("hot sulfuric acid"; 13; Fig. 2; col. 2, lines 25-38; column 3, lines 44-48).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to replace the spray etcher of Schutt with the etch bath and bubble plate of Chung et al.

The motivation for doing so would be to replace the etchant delivery means (ie, sparger etcher) with an alternate and equivalent etching means (ie a bath etcher).

Schutt and Chung et al do not teach a temperature sensor and control unit.

Kanda et al disclose a process control system (45, 47-57; Figure 10; column 9, line 12 – column 10, line 47) having a thermocouple for measuring the temperature of the etching solution (8, Figure 2; column 9, lines 22-23) used to etch a submerged substrate (2, Figure 3). Kanda

specifically teaches a control unit (45, 47-57; Figure 10; column 9, line 12 – column 10, line 47) for receiving a signal indicating the temperature (T) of the etchant from a temperature sensor ("thermocouple") and transmitting an etching termination signal (P _ 0) to the etch bath when the temperature reaches a target temperature. Further, Kanda teaches the etched thickness (Q; column 10, lines 10-15) of the substrate is derived from the temperature (T) of the first etchant.

Schutt, Chung, and Kanda do not teach using the total reaction energy as a reference. Schutt, Chung, and Kanda do not teach a controller that controls the first tank, the etch bath and the second tank. Schutt, Chung, and Kanda do not teach using gravity (i.e. weight) for separating the diluted etchant from the residual material.

Allies teaches a controller (340; Figure 3; column 3, lines 55-60) that controls the volume of fluid within numerous process tanks (column 3, lines 58-67), including controlling the temperature of said tank(s) (column 3, lines 58-67) resulting from numerous input signals (column 4, lines 1-10). Allies further teaches teach using gravity (i.e. weight) for separating the etchant ($CuCl_2$ etchant – column 3, lines 37-40) from residual material by mass/material filtration in filtration tank 338, Figure 3 – column 5, line 64 - column 6, line 5

Allies further teaches a concentration measuring device (pH, via sensor 330; column 5; lines 13-29) disposed at a first tank (320; Figure 3) for measuring a concentration of a first etchant ($[H^+]$) in a first tank (320; Figure 3); a temperature sensor (318, 319) installed in the etch bath (301/313), the temperature sensor measuring and monitoring a temperature of the etchant while the glass substrate is etched in the etch bath based on the to temperature information from the temperature sensor.

Schutt, Chung, Kanda, and Allies do not teach wherein the second tank (8) being connected to the first tank (11) to provide the separated diluted etchant to the first tank (11; column 2; lines 45-72) – claim 1. Schutt, Chung, Kanda, and Allies do not teach a water source as amended.

As to claim 1, Jones et al disclose a cleaning/etching solution containing hydrofluoric acid (col. 5, lines 49-60; col. 6, lines 33-35 and 51-54) and a water source (63; Figure 6A).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to control the etching operation for the etching apparatus of Schutt with the chemical processing control system of Kanda and Allies including using the total reaction energy as a reference by replacing Kanda's temperature in any of Kanda's "Q" equations (column 10) with "reaction energy" as derived from the well know thermodynamic relationship between molar enthalpy (per unit mass), heat capacity, and temperature[1]:

$$\frac{\partial H}{\partial T} \equiv c_p$$

The motivation for controlling the etching operation for the etching apparatus of Schutt and Chung et al with the chemical processing control system of Kanda and Allies, using "reaction energy", would have been to detect the termination of etching appropriately and precisely as taught by Kanda (column 10, lines 44-47) by an alternate a equivalent means of detecting said termination in using "reaction energy".

At the time of the invention it would have been obvious to a person of ordinary skill in the art to add Allies's mass/material separation filtration tank to Schutt's processing system.

[1] As demonstrated (MPEP 2116.01) in Physics for Scientists & Engineers, 2nd Ed. R.A. Serway, Saunders College Publishing, 1986. pp. 428 (see top-most equation).

The motivation to add Allies's mass/material separation filtration tank to Schutt's processing system is to further purifying the recycled spent etchant solution as taught by Allies (column 5, line 64 - column 6, line 5).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Schutt with Chung et al and Kanda to obtain the invention.

At the time of the invention it would have been obvious to a person of ordinary skill in the art for Schutt to add Jones' cleaning/etching solution containing hydrofluoric acid (col. 5, lines 49-60; col. 6, lines 33-35 and 51-54) and water source (63; Figure 6A) to the apparatus of Schutt, Chung, Kanda, and Allies.

Motivation for Schutt to add Jones' cleaning/etching solution containing hydrofluoric acid (col. 5, lines 49-60; col. 6, lines 33-35 and 51-54) is for using acid of varying strengths for removing contaminants as taught by Jones (column 5; lines 43-60). Motivation for Schutt to add Jones' water source (63; Figure 6A) is to control the concentration of the etching solution as taught by Allies' concentration measuring device (pH, via sensor 330; column 5; lines 13-29).

4. Claims 3-6, 8, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schutt (US 3,532,568 A) in view of Chung et al (U.S.Pat.5,000,795), Kanda (U.S. Pat. No. 4,886,590), and Allies, Victoria R. et al (U.S.Pat. 5,560,838), and further in view of Jones et al (U.S. Pat. No. 3,869,313).

Schutt, Chung, Kanda, and Allies are discussed above.

Schutt, Chung, Kanda, and Allies do not disclose expressly a rinse and drying bath for the substrate.

As to claims 3-5, 8, 9, and 12, Jones et al disclose a chemical processing apparatus containing a plurality of treatment chambers having a dip chamber with filling pumps, a spray chamber which serves as a rinse chamber or a drying chamber (col. 2, lines 20-39 and 63-68; col. 3, lines 1-10). The rinse chamber would be filled with deionized water from a deionized reservoir (col. 2, lines 52-55). An essential part of the apparatus is a conveyor means for automatically transferring the workpieces from treatment chamber to treatment chamber. (Fig. 1; Col. 3, lines 50-55). The conveyor allows for a plurality of substrates to be processed substantially at the same time. Using a pump to move fluid from one chamber to another is conventional. Jones further teaches a Acontrolled heater 67" (column 2, lines 28-35) used in the Atreatment≅ chamber that Amay be used as a drying chamber≅ (column 3, lines 1-3).

Jones et al disclose a cleaning/etching solution containing hydrofluoric acid (col. 5, lines 49-60; col. 6, lines 33-35 and 51-54). Jones et al disclose cone shaped bottom tanks (Figs. 6A-B).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the multiple chambers for rinsing and drying of Jones et al with the etching apparatus of Schutt, Chung et al, and Kanda.

The motivation for doing so would have been to provide treating operations such as rinsing and drying of substrates as taught by Jones et al.

Response to Arguments

5. Applicant's arguments filed May 28, 2010 have been fully considered but they are not persuasive.

6. Applicant states:

“

Independent claim 1 is allowable at least in that this claim recites a combination of elements, including, for example, "an undiluted HF solution tank to be connected to the first tank to supply the undiluted HF solution to the first tank", "a water source connected to the first tank to supply the water to the first tank", and "the undiluted HF solution, the water, and the separated diluted etchant are respectively supplied to the first tank from the undiluted HF solution tank, the water source, and the second tank to from the first etchant, the amount of the undiluted HF solution, the water, and the separated diluted etchant being controlled by the control unit controlling the first tank based on the concentration measured by the concentration measuring device." Applicants submit none of the cited references, singly or in combination, teaches or suggests at least these features of the claimed invention

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In response, the Examiner disagrees. The art of record identically teaches the amended, added, claim limitations. See above. The March 29, 2010 BPAI decision affirmed the Examiner’s rejections based on the same art of record and grounds in this action and the December 12, 2006 final rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 6pm EST. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering

art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272- 1435.

/Rudy Zervigon/

Primary Examiner, Art Unit 1792